IN THE CLAIMS

1. (original) A method for separating a plurality of mixed signals into a plurality of component signals comprising the steps of:

(a) producing a plurality of discrete Fourier transform (DFT) values corresponding to frequency components of an input segment of said mixed signals;

(b) updating cross correlation estimation matrices using said DFT values;

(c) computing, using a cost-function minimization process, an update value for a plurality of filter coefficients for a finite impulse response (FIR) filter using said cross correlation estimation values;

(d) filtering said mixed signals using said FIR filter having said updated filter coefficients to separate said mixed signals into one or more component signals; and

(e) iteratively repeating steps (a), (b), (c) and (d) for successive input segments of saidmixed signal.

2. (original) The method of claim 1 wherein step (c) further comprises the substeps of:

(c1) transforming said update filter coefficients from the frequency domain into the time domain;

(c2) zeroing any filter coefficients having a value other than zero for any time that is greater than a predefined time Q, where Q is less than a value of an input-segment length, T; thereby producing a set of constrained time domain filter coefficients; and

(c3) transforming said adjusted time domain filter coefficients from the time domain back into the frequency domain.

3. (original) The method of claim 1 wherein said cost-function minimization process is a gradient descent process.

4. (original) The method of claim 1 wherein said computation of said filter coefficient update values further includes an adaptation of update step sizes based on a normalization factor.

5. (currently amended) The method of claim 4 wherein said update values, including said update step-size adaptation, are computed according to

$$\Delta_t \mathbf{W}(\omega) = -\mu / h \, \nabla_W E$$

where μ is a fixed learning constant, h is a weighting factor for the step-size adaptation, and E is a filter-parameter cost function operating on a square difference respecting a diagonal covariance of said component signals~~, and E is a gradient step for E~~.

6. (original) The method of claim 1 wherein a running average of said cross correlation estimation values are produced according to

$$\hat{\mathbf{R}}_x(t,\omega) = (1-\gamma)\hat{\mathbf{R}}_x(t,\omega) + \gamma\mathbf{x}(t,\omega)\mathbf{x}^H(t,\omega).$$

where x(t,ω) is the mixed signal in the frequency domain.

7. (original) An apparatus for separating a plurality of mixed signals into a plurality of component signals comprising:

means for producing a plurality of discrete Fourier transform (DFT) values corresponding to frequency components of an input segment of said mixed signals;

means for updating cross correlation estimation matrices using said DFT values;

a cost-function minimization processor for computing an update value for a plurality of filter coefficients for a finite impulse response (FIR) filter using said cross correlation estimation values; and

an FIR filter having said updated filter coefficients to separate said mixed signals into one or more component signals.

8. (original) The apparatus of claim 7 wherein said cost-function minimization processor further comprises:

a first transformer for transforming said update filter coefficients from the frequency domain into the time domain;

means for zeroing any filter coefficients having a value other than zero for any time that is greater than a predefined time Q, where Q is less than a value of an input-segment length, T; thereby producing a set of constrained time domain filter coefficients; and

a second transformer for transforming said adjusted time domain filter coefficients from the time domain back into the frequency domain.

9. (original) The apparatus of claim 8 wherein said first transformer uses an inverse Fourier transform and said second transformer uses a Fourier transform.

10. (currently amended) The apparatus of claim 7 wherein said ~~computation of said filter coefficient update values further includes an adaptation of update step sizes based on a normalization factor~~ cost-function minimization processor carries out a gradient descent process.

11. (original) The apparatus of claim 7 wherein said computation of said filter coefficient update values further includes an adaptation of update step sizes based on a normalization factor.

12. (currently amended) The apparatus of claim 11 wherein said update values, including said update step-size adaptation, are computed according to

$$\Delta_t \mathbf{W}(\omega) = -\mu/_h \nabla_W E$$

where μ is a fixed learning constant, h is a weighting factor for the step-size adaptation, and E is a filter-parameter cost function operating on a square difference respecting a diagonal covariance of said component signals~~, and E is a gradient step for E~~.

13. (original) The apparatus of claim 7 wherein a running average of said cross correlation estimation values are produced according to

$$\hat{\mathbf{R}}_x(t,\omega) = (1-\gamma)\hat{\mathbf{R}}_x(t,\omega) + \gamma \mathbf{x}(t,\omega)\mathbf{x}^H(t,\omega).$$

where $x(t,\omega)$ is the mixed signal in the frequency domain.

14. (original) The apparatus of claim 7 further comprising a voice recognition system for processing at least one of said component signals.

15. (original) A computer readable storage medium containing a program that, when executed upon a general purpose computer system, causes said general purpose computer system to become a specific purpose computer system that performs a method for separating a plurality of mixed signals into a plurality of component signals comprising the steps of:

(a) producing a plurality of discrete Fourier transform (DFT) values corresponding to frequency components of an input segment of said mixed signals;

(b) updating cross correlation estimation matrices using said DFT values;

(c) computing, using a cost-function minimization process, an update value for a plurality of filter coefficients for a finite impulse response (FIR) filter using said cross correlation estimation values;

(d) filtering said mixed signals using said FIR filter having said updated filter coefficients to separate said mixed signals into one or more component signals; and

(e) iteratively repeating steps (a), (b), (c) and (d) for successive input segments of said mixed signal.

16. (original) The computer readable medium of claim 15 wherein step (c) further comprises the substeps of:

(c1) transforming said update filter coefficients from the frequency domain into the time domain;

(c2) zeroing any filter coefficients having a value other than zero for any time that is greater than a predefined time Q, where Q is less than a value of an input-segment length, T; thereby producing a set of constrained time domain filter coefficients; and

(c3) transforming said adjusted time domain filter coefficients from the time domain back into the frequency domain.

17. (original) The computer readable medium of claim 15 wherein said cost-function minimization process is a gradient descent process.

18. (original) The computer readable medium of claim 15 wherein said computation of said filter coefficient update values further includes an adaptation of update step sizes based on a normalization factor.

19. (original) The computer readable medium of claim 18 wherein said update values, including said update step-size adaptation, are computed according to

$$\Delta_t \mathbf{W}(\omega) = -\mu/_h \nabla_W E$$

where µ is a fixed learning constant, h is a weighting factor for the step-size adaptation, E is a filter-parameter cost function operating on a square difference respecting a diagonal covariance of said component signals, and E is a gradient step for E.

20. (previously amended) The computer readable medium of claim 15 wherein a running average of said cross correlation estimation values are produced according to

$$\hat{\mathbf{R}}_x(t,\omega) = (1-\gamma)\hat{\mathbf{R}}_x(t,\omega) + \gamma\mathbf{x}(t,\omega)\mathbf{x}^H(t,\omega).$$

where x(t,ω) is the mixed signal in the frequency domain.